Chapter 4: Natural Resources Element

4.1 Vision Statement

"The Natural Resources Element of the Comprehensive Plan serves to protect, preserve, conserve and utilize the unique traits of our regional environment to its highest potential"

The Natural Resources Element of the Comprehensive Plan is dedicated to the local landscape and the natural features that this landscape encompasses. This chapter serves to outline goals and objectives for the effective protection, preservation, conservation, and utilization of the natural environment for the future benefit of the citizens of Greenwood County.

4.2 Climate

A basic environmental factor is the climate. The climate of South Carolina is classified within the humid subtropical region. This climatic region is characteristic of hot, humid summers and mild winters. For Greenwood, the average annual temperature was 60.6°F from data collected from 1948 to 2000 by the State Climatology Office. During the same time period, the average annual high temperature was 72.8°F, while the average annual low temperature was 48.4°F. The warmest temperatures were typically found during the month of July while the coldest temperatures were in January (*See* Figure 4-1).

Precipitation is another important factor. The Greenwood area receives an average of 45.9 inches of annual precipitation. The months with the greatest amount of precipitation include March and January. The driest months occur during September and October (*See* Figure 4-2).

As urbanization increases, so too does the microclimate or the climate of a particular area. An urban area, sometimes referred to as a "heat island", is typically three to ten degrees warmer than the surrounding countryside. Large expanses of concrete and asphalt have been shown to alter the local climate; asphalt and concrete absorbs the sun's light and then heats the air during the cooling periods of the evenings, making local climates warmer over a given period of time. Open burning and industrial emissions have been found to increase temperatures in the local climate. Trees are a nullifying factor to these heat islands as trees provide reduced air temperatures, reduced glare and reduced wind speeds.

Figure 4-1: Average Annual Temperatures

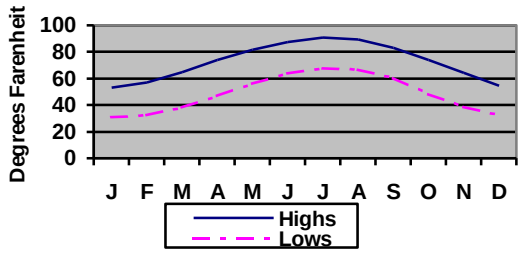
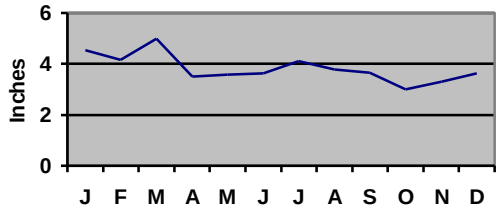


Figure 4-2: Average Annual Precipitation



Source: SC Department of Natural Resources, 2009.

4.3 Air Quality

The Environmental Protection Agency (EPA) and the South Carolina Department of Health and Environmental Control (DHEC) regulate and protect the air quality within the state. Most of South Carolina, including Greenwood County, is below the threshold for ambient air quality standards. However, increased urbanization in the Greenville, Augusta, and Columbia metropolitan areas will have future impacts on our local air quality.

One of the main concerns with air quality is ozone. Ground-level ozone (O_3) forms when oxides of nitrogen and volatile organic compounds are heated by the sun during the spring and summer months.

Ground-level ozone is a natural occurring effect that humans can exacerbate. South Carolina has seen an increase in ozone with the increase in population, increase in automobile usage, and increase in development (especially industrial development) within the last ten years. In December of 2002, Greenwood County entered into an Early Action Compact with 45 of the 46 counties in the state to develop a state-wide early action plan to reduce ozone. DHEC is studying the increase in ozone to the increase in asthma cases within South Carolina communities. Greenwood County should analyze these factors in relation to the growing ozone problem and develop local solutions that manage ozone within acceptable levels that work in-hand with the promotion of development.

Between 2000 and 2002, Greenwood County was below the 8-hour ozone standard established by DHEC. The only minor air quality problems found in Greenwood County can be attributed to industrial uses, automobile emissions and open burning practices. In a 1997 citizen opinion survey, 73.47% of those questioned felt that the air quality of Greenwood County was good or excellent.

4.4 Slope Characteristics

Greenwood County is located within the Piedmont region of South Carolina. This region is typified by rolling hills within an elevation range of 300 feet to 1,200 feet above mean sea level (MSL). The lowest point in Greenwood County is found on the Newberry County Line at the most eastern point of the Saluda River (370' MSL). Conversely, the highest point is found northeast of the Shoals Junction community south of Smith Street Extension (730' MSL). The elevation difference between these points is 360 feet within a distance of 27 miles; the slope between the highest and lowest points in the County is 13.33 feet per mile. The elevation differential in Greenwood County is equivalent to the elevation differential between Greenwood County and the coast of South Carolina (*See* Figure 4-3).

Of the municipalities, the Town of Hodges has the highest elevation at 707 feet MSL. The Town of Troy has the lowest elevation at 517 feet MSL. The City of Greenwood is located at 660' MSL, the Town of Ware Shoals at 642' MSL and the Town of Ninety Six at 550' MSL. The elevation of Lake Greenwood is 440' MSL, therefore lower than Greenwood's municipalities.

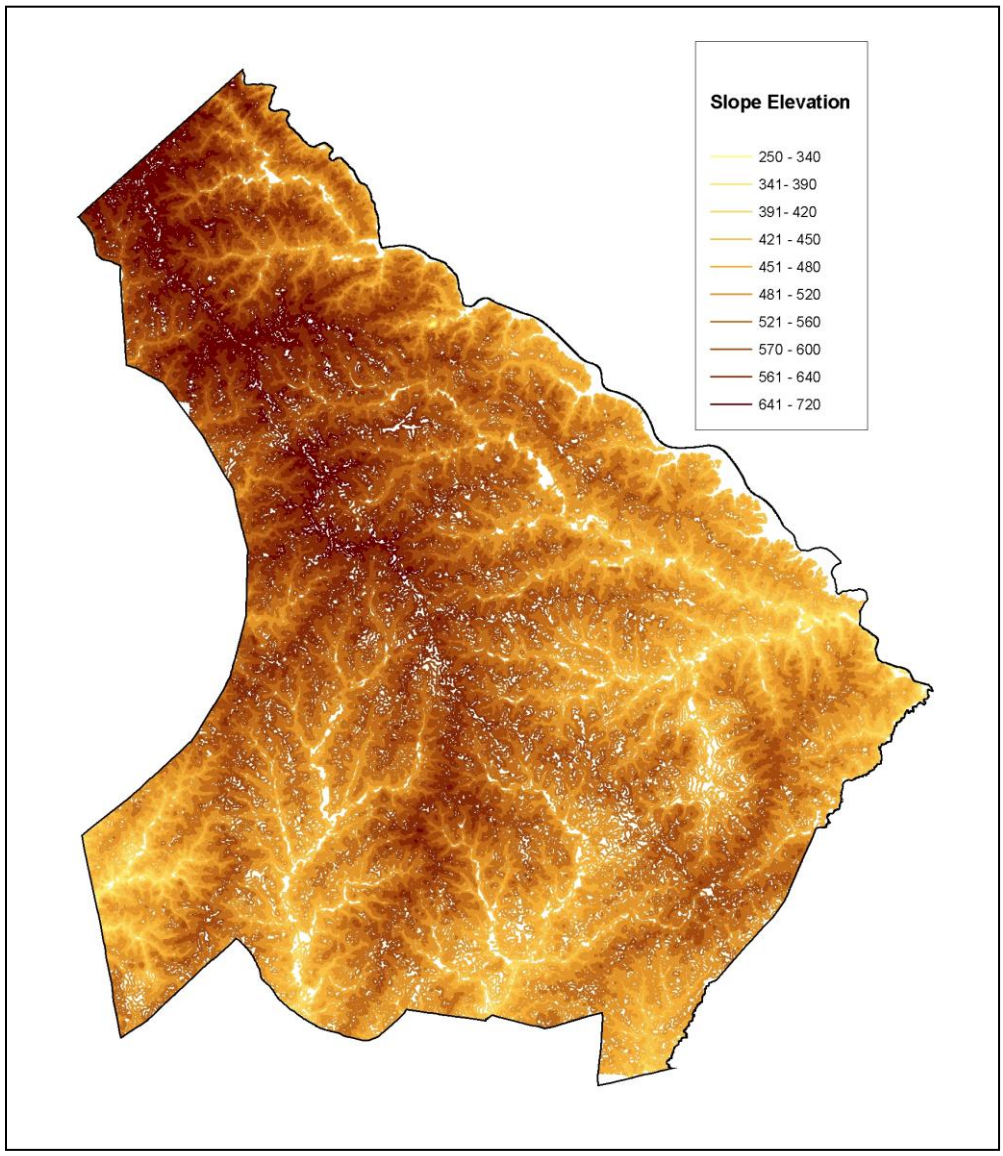
4.5 Soils

Soils affect the function or use of property as this is the foundation for the usage of land. Soil types determine what activities can and should be conducted in a given area. According to the General Soil Map, there are ten basic soil associations in Greenwood County with three major categories: loamy soils throughout, silty surface layer and clayey subsoil and loamy surface layer and clayey subsoil. A soil association is defined by the United States Department of Agriculture (USDA) as a grouping of soil types that has a distinctive trait related to the soil types. These soil associations are used for general planning. However, this generalization is not to be used on a parcel specific basis; on a given piece of property there are many types of soils comprising the area.

In certain areas of Greenwood County, sites for dwellings with on-site sewage disposal are limited due to the permeability of the soil, depth to the water table, susceptibility to flooding, soil erosion, lateral seepage, and downslope flow of effluent. However, those areas with such problems are few or relatively small in size. Primarily, when soils are not too wet or impervious, sewage from buildings with septic tanks is properly purified. The chance of polluting groundwater or wells is minimized. Proper soils also provide stable support to structures. On moderate to minor slopes, soils erode less and thus reduce costs for foundation construction, septic or sewer system installation and roadway construction. Sandy soils, which are too permeable, allow sewage to flow too quickly, resulting in polluted groundwater and wells. Soils that are not permeable, such as clay, causes sewage to seep to the surface. Bedrock, too close to the surface, causes sewage to be deflected back to the surface.

Industrial sites are also dependant on certain soil types. Soils with large rocks or boulders increase development costs. Other economic factors include bearing strength, slope, depth to the water table, hazards of flooding and depth to rock. Improper soils may be unable to bear the weight of construction equipment, buildings, or traffic which increases the potential for settling, shifting and slipping of the structure.

Figure 4-3 Slope Characteristics of Greenwood County



Source: Greenwood County GIS Department, 2009.

4.6 Hydrology

Greenwood County is located within two hydrologic areas: the Saluda-Edisto Basin and the Savannah Basin. The hydrology of Greenwood County includes many factors including topography, water features, and natural drainage ways. A hydrologic line runs primarily along the ridge line. This line traverses northwest to southeast through the center of the County along the route of U.S. Highway 178. Basically, water that falls north or east of Highway 178 will eventually flow into the Saluda River while water falling south or west of Highway 178 will eventually flow into the Savannah River.

The Saluda Basin, within Greenwood County, is subdivided into three sub-basins. The first sub-basin includes the area north of South Carolina Highway 702 where water flows into Lake Greenwood. The second sub-basin includes the Coronaca, Wilson and Ninety Six Creek watersheds where water flows into the Saluda River south of the Buzzard Roost Dam. The third sub-basin is located east of South Carolina Highway 246 including Halfway Swamp Creek.

Greenwood County has had some hydrologic problems in the past, especially in the Rock Creek section of the Saluda Basin Watershed. The Rock Creek section extends from Highway 72 East and Mathis Road east towards Haltiwanger Road and Wingert Road. Flooding along the creek, caused by development within the area and an outdated FEMA flood study, has compromised the development potential of north-central Greenwood County. The South Carolina Storm Water Regulations enforced by DHEC state that developers must hold water on-site in case of a 10-year, 24-hour storm event. Also, developments on a site less than two acres are exempt from these regulations. This loophole is detrimental since ten two-acre sites have the same effect as one twenty-acre site without retention. This standard is not sufficient for the Rock Creek area. Other areas within Greenwood County have a concern, yet are not as critical as the Rock Creek area at this time.

4.7 Water Quantity and Water Quality

Water covers approximately 7,913 acres in Greenwood County or 2.7% of the County's land area (*See* Figure 4-4). As a basic resource, water is a necessity for plants and animals. Lake Greenwood is the largest water body in Greenwood County. This lake has a surface area of 11,400 acres and a maximum and mean depth of 68.9 feet and 23.0 feet, respectively. The lake was constructed in 1940 and is used for hydroelectric power generation, recreation and as a public water supply. Greenwood County planned the Buzzard Roost project and in 1933 applied for monies from the Public Works Administration (PWA) to build it. Opposition from private power companies delayed construction until 1938 when the U.S. Supreme Court declared the project constitutional. This decision opened the way for a number of federally funded hydroelectric projects, including the Tennessee Valley Authority (TVA).

The Saluda River is the largest river flowing through Greenwood County. This river is the political boundary between Greenwood County and Laurens and Newberry Counties. The portion of the Saluda contained in Greenwood County is 36 miles long. The Saluda flows from Sassafras Mountain at the Pickens, Greenville and Transylvania (North Carolina) County lines to the City of Columbia and the Congaree River. This watershed is one of five major watersheds that drain South Carolina, with the Saluda River watershed affecting the most populous areas of the state.

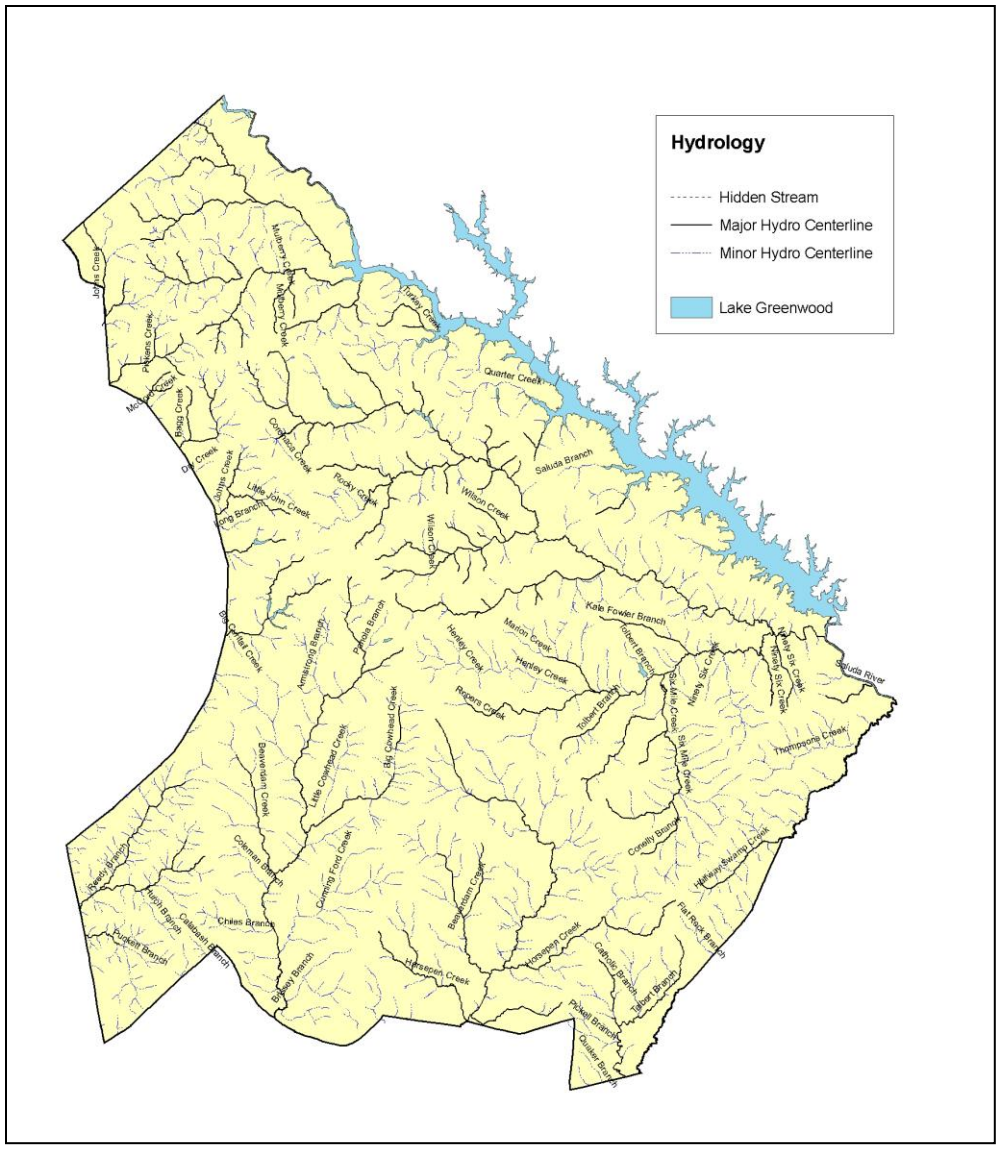
Both the Saluda River and Lake Greenwood serve as municipal water sources for the City of Greenwood and the Towns of Ninety Six and Ware Shoals. One-third to one-fourth of the households in Greenwood County obtain their water from groundwater or wells. Therefore, the need for protection of groundwater sources is imperative. In 1994, water usage was primarily from surface water sources as 11.73 million gallons were used per day from these water sources. Water used for hydropower amounted to 773.09 million gallons in 1994.

The *1995 Watershed Water Quality Management Strategy for the Saluda-Edisto Basin* by DHEC detailed water quality of the Saluda River from Big Creek to the Lake Greenwood dam and the Ninety Six Creek and its tributaries.

The Saluda River water quality is affected by nonpoint source runoff. Aquatic life uses are not supported in major sections of the river as methoxychlor, a pesticide, was found in 1992 that exceeded aquatic life criteria. Furthermore, there has been a steady decline in dissolved oxygen and an increase in turbidity. Also, dibromochloromethane was detected in 1988 which is a by-product of chlorine use in municipal water systems.

The water quality of Lake Greenwood is at a higher level than the Saluda River section. Of the four DHEC monitoring sites on the lake, aquatic life uses are fully supported at all four sites. Declining levels of pH in the water were found in the Reedy River arm, the main body of the lake, and near the dam. However, high pH levels are typical of lakes with significant amounts of phytoplankton. There has been a decline in dissolved oxygen in the Reedy River arm.

Figure 4-4 Hydrology of Greenwood County



Source: Greenwood County GIS Department, 2009.

Another area of analysis is the Cane Creek which fully supports aquatic life. However, degradation of the area is occurring through increased sedimentation. This area is also noticing a declining trend in dissolved oxygen. The Ninety Six Creek division is divided into the Ninety Six Creek, Coronaca Creek, and Wilson Creek. The Ninety Six Creek supports aquatic life with an increase of dissolved oxygen and a decline of pH. High concentrations of nickel and fecal coliform bacteria were found in 1988. The Coronaca Creek is unable to support aquatic life uses due to a lack of dissolved oxygen and declining pH levels. Wilson Creek is an improving water body since dissolved oxygen is increasing, the possibility of aquatic life uses is increasing and fecal coliform bacteria is decreasing.

All of the water bodies in Greenwood County are affected by two major issues: point source and nonpoint source pollution activities. Examples of point sources that affect water bodies include municipal sewage, industrial wastes, and thermal effluent. Conversely, the most serious nonpoint source pollution problems often result from persistent erosion of soil, from nitrogen fertilizers, animal wastes and biocides applied to the landscape, and from nitrogen and other nutrients and toxic substances in surface runoff and eventually stream flow. Newly tilled or logged land and construction areas are erosion prone and produce large amounts of sediment. Water pollution from nonpoint sources such as agricultural activities are

difficult to identify and control. Overall, recent public opinion found that water quality in Greenwood County is not a problem as 60.19% rated the quality as "good".

4.8 Flood Plain and Flood Way Areas

Greenwood County contains an intricate network of flood plain areas. These areas are formed from the slope of the land and serve as the natural drainage ways that have developed over time. When an unusual amount of rain falls, these natural drainage ways fill with water. The Federal Emergency Management Agency (FEMA) promotes flood safety and designates areas within the U.S. that are flood hazard areas. Most of the flood plains within Greenwood County are designated as Zone AE by FEMA. This means that base flood elevations have been determined and that there is a potential for inundation at least once in one hundred years. The *1989 Greenwood County Flood Insurance Study* by FEMA reported that the principal flood problem is "the flooding of basements, garages, lawns, and gardens."

The primary flood prone area is north of the City of Greenwood in the Rocky Creek stretch of the Wilson Creek watershed. This watershed drains half of the City of Greenwood and the area has had numerous drainage problems within the last ten years. Many of these problems have been attributed to the development of commercial properties along SC Highway 72 of less than two acres in size.

Another item that affects the volume of water within flood plain areas is the amount of impervious surfaces. Impervious surfaces include asphalt, concrete, buildings, or anything that does not allow storm water to absorb into the soil. Additional impervious surfaces increases both the quantity and velocity of water on a site.

Development styles and requirements on development can greatly reduce the amount of storm water entering drainage ways. To reduce runoff, best management practices are encouraged, such as detention and retention ponds, increasing green spaces, landscaped medians and streamside buffers. Another factor is poorly planned, low density growth or sprawl. The Charleston Harbor Project's *Belle Hall Study of 1995* suggests that modifications from sprawl development to traditional town development decreases the amount of runoff, sediment and chemical oxygen demand. Typical sprawl development includes large lots with cul-de-sacs in a ribbon roadway pattern in comparison to traditional town development which includes small lots, clustering of land uses and higher densities based on a grid roadway pattern.

4.9 Fault Lines

Greenwood County is traversed by three fault lines within the fault system of South Carolina. Of these three, one stretches along the border between Greenwood and Laurens and Newberry Counties following the Saluda River and ending 4.5 miles north of downtown Ninety Six. This fault also lies below the Buzzard Roost dam. The second fault line is a zone that runs from Highway 185 east to Hodges and Highway 246 to Cokesbury and Coronaca just north and east toward Lake Greenwood. This is the largest fault line in Greenwood County.

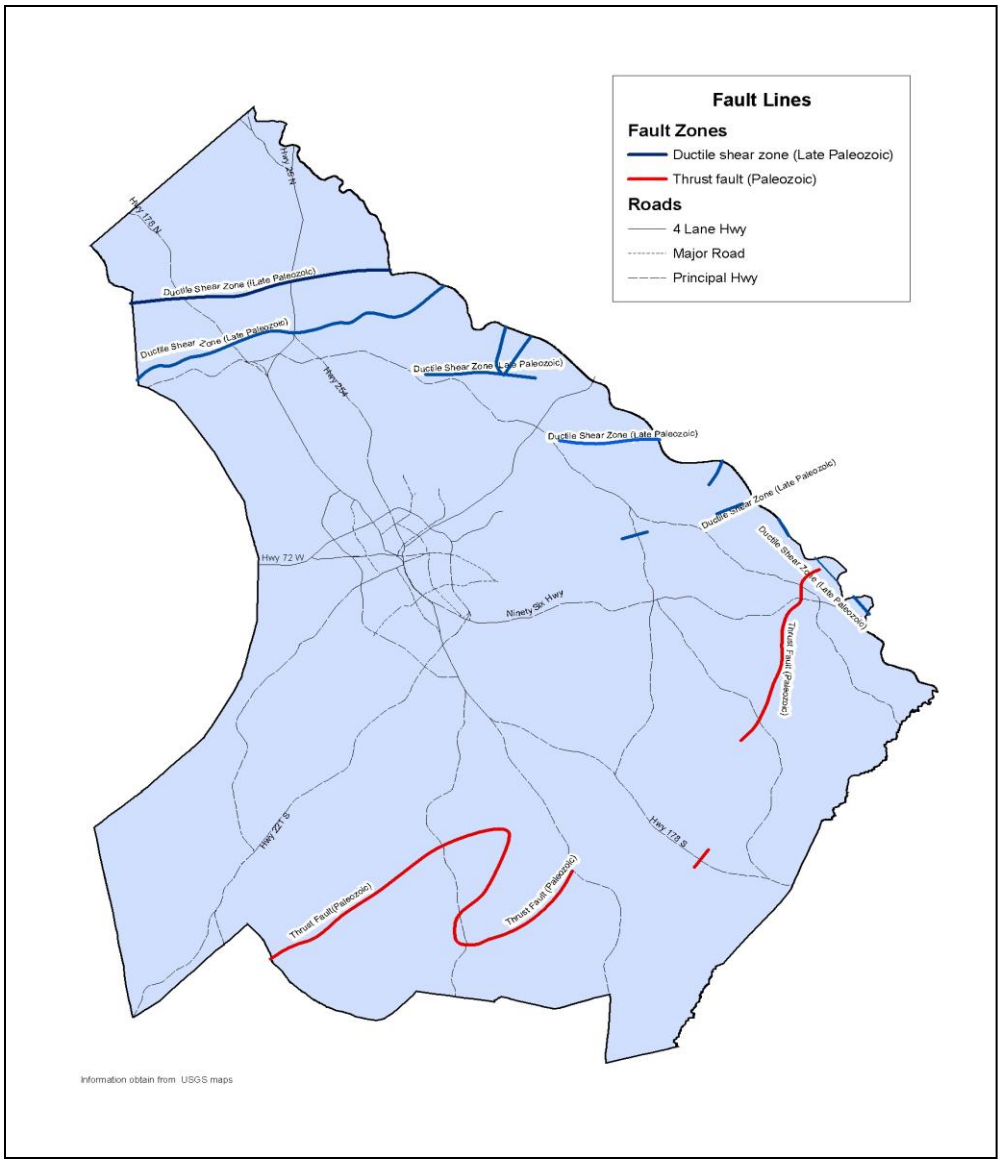
The third fault lies in the southeastern corner of the County. The area runs from the Buzzard Roost dam west to one mile north of Kirksey, south to Callison, north to the Phoenix area and southwest toward the Town of McCormick (*See* Figure 4-5).

Earthquakes are prone to the area as the *Index Journal* recently reported that two minor earthquakes were registered in 1992 and 1996. The 1992 earthquake was centered in McCormick County and caused damage in the Town of Troy. The 1996 tremor was recorded six kilometers northwest of the City of Greenwood at least one mile below the earth's surface.

4.10 Mining and Mineral Deposits

The South Carolina Geological Survey, South Carolina Land Resources Conservation Commission and United States Bureau of Mines report the mineral commodities mined in Greenwood County include granite (crushed stone), sand, and shale. Local extraction activities are primarily crushing and loading surface deposits and strip-mining operations for subsurface deposits. DHEC regulates mining through the issuance of permits for extraction activities.

Figure 4-5 Fault Zones of Greenwood County



Source: Greenwood County GIS Department, 2009.

4.11 Prime Agricultural Lands

Greenwood County has traditionally been a rural area. However, with increased development the amount of land designated for crops and pasture is decreasing. According to the Natural Resources Conservation Service (NRCS), cropland has decreased by 5,681 acres or 60.24% between 1977 and 1996. In 1996, cropland made up approximately 1.28% of the land. Pastureland decreased by 400 acres or 1.26% during the same time period. Land designated for pasture incorporated 10.71% of the total county land area. Urban growth was found to be the reason for these declines as urban land increased 23.28% between 1977 and 1996.

Greenwood County is located within one of the most fertile areas in South Carolina. The NRCS has delineated three areas within South Carolina in which more than 50% of the land is prime farmland. Prime farmland is defined as land that has the best combination of physical and chemical characteristics for agricultural production. It has the soil quality, growing season, and moisture supply needed to economically sustain high crop yields when managed properly. Greenwood County is found within the largest fertile area of South Carolina, stretching from Greenwood County east through Saluda County

(*See* Figure 4-6). Approximately 32,000 acres of Greenwood County is an area of greater than 50% prime farmland. Due to the relatively small area within South Carolina of fertile land, this area is extremely important to the agricultural productivity of Greenwood County and the state.

The NRCS categorizes the soil types by their value for agricultural applications. The four most valuable soil types are Cecil sandy loam, Georgeville silt loam, Herndon silt loam, and Hiwassee sandy loam (all at two to six percent slopes). These four soil types are listed as prime farmland which is defined as "land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and ... has the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when treated and managed... according to acceptable farming methods."

The Clemson University Extension Agency reports that between 1994 and 1996, the number of farms in Greenwood County decreased from 440 to 410, while the average size of each farm increased from 182 acres to 192 acres. However, the total land in farms decreased during the same time period from 80,100 acres to 78,600 acres: a decrease of 1.87%. This decrease was less than the state average of -1.96%.

As far as agricultural production, Greenwood County ranks high in many areas. Greenwood County was the 7th largest poultry producer behind Newberry, Kershaw, Lexington, Darlington, Oconee and Saluda Counties in 1994. As well, Greenwood County was the 3rd largest in egg production behind Kershaw and Newberry Counties in 1995 with more than 143 million eggs produced.

Cattle and hay production are agricultural highpoints in Greenwood County. As of January 1996, Greenwood County ranked 12th in the state for cattle and calves as 17,000 were estimated. In 1995, cash receipts for cattle were valued at almost $12 million: 16th highest in South Carolina. Greenwood County ranked 15th in state hay production in 1995 with 19,600 tons produced. This trend seems to be continuing as hay production and acres harvested increased between 1994 and 1995 from 12,800 to 19,600 tons and 7,500 and 8,900 acres, respectively. The economic benefit of agriculture is increasing as the total receipts of crops and livestock for Greenwood County totaled $14.4 million in 1994 and increased to $14.8 million in 1995.

As development increases in Greenwood County, agricultural land is reduced. Many areas throughout the nation employ rural zoning categories to reduce the density of residential development and the conflicts between housing and farming (*i.e.* sounds of heavy farm equipment, smell of manure or drifting chemical sprays, or clouds of dust). The need for countryside preservation and small, yet dense, villages for commerce will be necessary in the future.

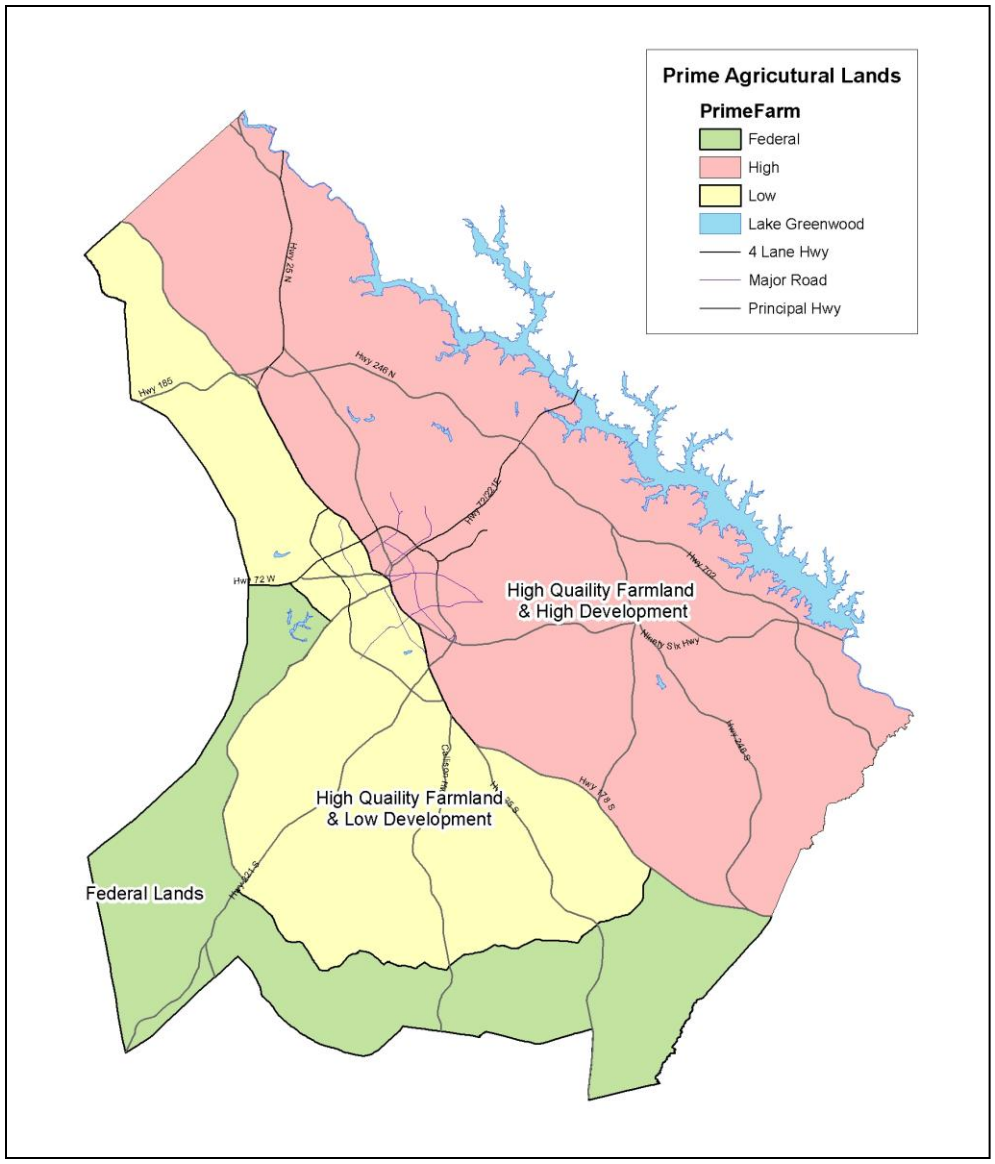
4.12 Prime Forest Lands

A renewable resource, forests are a major component of the natural landscape. Trees provide food, clothing, building materials, fuel, and recreational opportunities while protecting and enhancing soil, water, and air quality. On another level, forests provide an aesthetic value to the community.

Greenwood County is fortunate to be one of eleven South Carolina counties that are a part of the Sumter National Forest system. The Sumter National Forest is divided into three sections. Greenwood County is located within the northeastern section of the western piedmont division. Other counties in this division include Saluda, Abbeville, McCormick and Edgefield Counties. The Sumter National Forest encompasses approximately 10,951 acres, or 3.75%, of Greenwood County. Most of this land is located along the southern and western borders of Greenwood County from south of US Highway 178 East to south of SC Highway 72 West.

Most of Greenwood County's timberland is 59% loblolly and shortleaf pines and 41% oak. In 1993, the US Department of Agriculture Forest Service identified 40.2% of the stands of timberland in Greenwood County as sawtimber. This same study calculated a total of 961 million board feet of sawtimber. This relates to an economic benefit to the community through jobs and timber sales. A 1994 preliminary study of forest products showed an annual value of $20.6 million for all forest products in Greenwood County: 13th in state value. Also notable, 25% of the proceeds from annual timber sales on national forest lands state-wide are returned to counties with national forest holdings.

Figure 4-6 Prime Agricultural Lands



Source: Natural Resource Conservation Service, 1998.

Approximately $25,539 was paid to Greenwood County in fiscal year 1996 for roads and schools. This amounted to $2.33 per acre returned to the community.

A recent draft of the *Sumter National Forest Summary of the Analysis of the Management Situation* stated the following:

> *Increased population growth and development... are changing the character of the landscape. Continuing growth and development is reducing the open space that is now farms, forests, and pastures. This development may reduce wildlife habitat, change the scenic character of the landscape and increase the wildland/urban interface concerns.*

The area of Greenwood County that is most impacted by development is national forest land south of SC Highway 72 between Greenwood and Abbeville. Southern and southwestern Greenwood County has the lowest population densities. However, we must note that the last three censuses have shown the percentage of population in rural Greenwood County has increased from 58% to 65%.

The concept of sustainable forestry was first introduced by the American Forest and Paper Association. This group states that "sustainable forestry means managing our forests to meet the needs of the present without compromising the ability of future generations to meet their own needs by practicing a land stewardship ethic which integrates the growing, nurturing, and harvesting of trees for useful products with the conservation of soil, air, and water quality, and wildlife and fish habitat." The best way to protect the forests are through the forestry industry as a leader; seventy-two percent of the state's forest area is owned by nonindustrial private forest landowners.

Best Management Practices are recommended forestry practices that help minimize the impact on water quality, reduce soil erosion, and protect streamside areas. According to *South Carolina's Best Management Practices for Forestry* by the South Carolina Forestry Commission, BMPs are issued as a guide for the public to follow.

> *The concept of BMPs was first introduced in response to federal legislation, the Clean Water Act, as a practical and effective means to reduce nonpoint source pollution. Compliance with BMPs is required for forestry activities which involve discharge of dredge or fill materials into jurisdictional wetlands to qualify for the silvicultural exemption under Section 404(f) of the Clean Water Act. Compliance with BMPs is recommended on all sites on which there is a potential for violating water quality criteria as defined by the South Carolina Pollution Control Act.*

Every attempt, where possible, should be undertaken by property owners to follow the BMPs as established by the South Carolina Forestry Commission. Harvesting operations should be carefully planned and executed with the intent of protecting the site.

Streamside Management Zones (SMZs) are good ideas and are incorporated in the Forestry BMPs. Streamside areas are in need of special protection. By protecting areas along stream banks reduces erosion and sedimentation in the local waterways. SMZs also slow the rush of water in times of flooding.

Prescribed fire is a natural part of the forest environment. A benefit of prescribed fire is wildfire hazard reduction of fuel sources such as leaves, pine needles, and twigs. Wildlife management is beneficial to species such as turkey and deer for food and habitat. Some species are dependent on this periodic burning. Forest management and aesthetic enhancement are benefits of prescribed burning to clear thick underbrush that can clog animal movement and "open the forest up."

Trees serve the environment in many ways. Trees decrease runoff, protect fields and farmsteads, and shade homes and streets which decreases utility usage. Wildlife are dependent on trees for food and cover. Clean air is another important factor; trees produce oxygen and remove air pollution. Energy conservation is a regional factor where trees help. Overall, there is a need to conserve our forests while fostering the economic and natural benefits of forested lands.

4.13 The Urban Forest

The Urban Forest is a term used to define trees within an urban area that are used for landscaping or aesthetic appeal, soil stability, energy conservation, air pollution and noise pollution reduction, climate modification, economic stability, or wildlife habitat. All of these benefits that trees provide are essential for a healthy community. Over the past decade, Greenwood County has experienced commercial, industrial and residential development that has transformed the natural landscape and increased the size of our communities. As land is cleared, the need for protection of existing trees or replacement of comparable species is necessary for a healthy and stable urban forest. More importantly, the economic benefits from the urban forest strongly justify the expense, if any, for maintenance of this resource. A recent questionnaire of county residents found that 95.7% of those sampled felt that trees should be protected or replaced when development occurs. Trees are especially valuable to neighborhoods. A 1998 study by the NRCS in the Greenville Hampton-Pinkney neighborhood, reported by *The Greenville News* showed that trees save homeowners money in cooling costs, slow rainwater runoff in yards that can cause flooding and remove pollutants from the air. Specifically, the study found a $1,258 energy savings for the one-block study area per year, a $48.39 per year energy savings per home, a 39.4% reduction in stormwater runoff, and a $1,329 per year benefit in pollution removal.

Cities without trees are “heat islands”; the National Arbor Day Foundation proposes that 100 million additional mature trees in U.S. cities would save $2 billion per year in energy costs. Windbreaks can lower heating bills 10 to 20%; shade trees planted east and west of your home can cut cooling costs 15 to 35%. Street trees shade the concrete and help cool the entire neighborhood. On a more local level, trees increase property values.

The National Arbor Day Foundation has established a program for recognition of communities that are committed to tree planting and care: Tree City USA designation. The City of Greenwood would be a leader in Greenwood County toward this endeavor.

4.14 Plant Habitats

Greenwood County is home to numerous species of plants. The Sumter National Forest, in southern Greenwood County contains a dense population of plants in their wild and natural state. The South Carolina Department of Natural Resources and the Nature Conservancy report on rare, threatened and endangered plants throughout the state. Of those plants that are rare, threatened or endangered, five have been located in Greenwood County in recent years: the Southeastern Tickseed, the Carolina Gentian, the Virginia Quillwort, Oglethorpe’s Oak and the Small Skullcap. These species have been recorded in locations within Greenwood County with most of these species found in the southeastern portion of the County. Less than half of these plants are found within the Sumter National Forest. Only one species, the small skullcap, was found in western Greenwood County.

4.15 Animal Habitats

As a predominately rural county, Greenwood has a number of animal species that inhabit forests, fields, rivers, and lakes. Specifically, the South Carolina Department of Natural Resources (DNR) has identified 47 reptiles, 29 amphibians, 61 mammals, and 194 birds that are commonly found in the County. Of these, seven are endangered and four are threatened (*See* Figure 4.8). Endangered species are those that are near extinction while threatened species are those animals that are near extinction and rare in certain ranges where they were once bountiful. It is important that these animals are protected in their home ranges. Many of these species are found throughout Greenwood County and are not limited to specific areas, except perhaps the Bald Eagle and Osprey that are found around Lake Greenwood.

Animals in Greenwood County are economic resources that are many times overlooked. In a 1992 Clemson University report of the *Economic Impact of Hunting on Rural Communities: Jasper and McCormick Counties, South Carolina,* the total estimated annual economic impact of private land hunting was $8.9 million in Jasper County and $6.6 million in McCormick County. The total expenditures to community businesses in McCormick County was estimated to be $3.3 million. There have not been any definitive studies of the economic impact of hunting in Greenwood County. However, staff members of the South Carolina Department of Natural Resources estimate that the McCormick County figures are comparable for use in Greenwood County.

Georgia Power Company has established a model wildlife habitat program that gives landowners in Georgia cash grants to create wildlife habitat on land under electric transmission lines. Under the program, participants are eligible to receive $100 per acre during the first year and $35 per acre for the second year.

In South Carolina, the South Carolina Wildlife Federation is working with the DNR, National Wild Turkey Federation, and Duke Energy on a program to manage lands to enhance wildlife habitat along the I-85 corridor. The purpose of the WAIT Program (Wildlife and Industry Together) is to encourage industries to offset habitat loss by devoting under-utilized corporate lands to wildlife through the development of habitat plans. The WAIT program offers opportunities for corporations to realize cost savings through reduced land management costs, enhanced employee enthusiasm and environmental awareness, increased partnerships with external community groups, increased benefit to the environment, and demonstrated commitment to responsible environmental stewardship.

Figure 4-7 Endangered Plant Species in Greenwood County

Southeastern Tickseed *(Coreopsis gladiata)* The species is a concern in South Carolina. It is very rare throughout its range or found locally in a restricted range, or having factors making it vulnerable. Globally, the species is secure though it may be rare in parts of its range. In South Carolina, the status of the species is unknown.
Carolina Gentian *(Frasera caroliniensis)* The species is a concern in the southern region. It is demonstrably secure globally, though it may be rare in parts of its range. It is critically imperiled state-wide because of extreme rarity of because of some factor(s) making it especially vulnerable to extirpation. **Virginia Quillwort** *(Isoetes virginica)* Globally, the species is either very rare throughout its range or found locally in a restricted range, or having factors making it vulnerable. It is imperiled state-wide because of extreme rarity or due to some factor(s) making it vulnerable to extirpation.
Oglethorpe's Oak *(Quercus oglethorpensis)* The species is a concern in South Carolina. It is imperiled globally because of rarity factor(s) making it vulnerable; either very rare throughout its range or found locally in a restricted range, or having factors making it vulnerable. The species if rare or uncommon in South Carolina.
Small Skullcap *(Scutellaria parvula)* The species is a concern in South Carolina. Apparently secure globally, the species may be rare in parts of its range.

Source: SC Department of Natural Resources, 2004.

Figure 4-8 Endangered and Threatened Animal Species in Greenwood County

Endangered Webster's Salamander *(Plethodon websteri)* Indiana Myotis [Bat] *(Myotis sodalist)* Rafinesque's Big-Eared Bat *(Plecotus rafinesqui)* Eskimo Curlew [Shorebird] *(Numenius borealis)* Red-Cockaded Woopecker *(Picoides borealis)* Bewick's Wren *(Thryomanes bewickli)* Carolina Heelsplitter [Mussel] *(Lasmigona decorata)*
Threatened Small-footed Bat *(Myotis leibii)* Cooper's Hawk *(Accipiter cooperii)* Bald Eagle (*Haliaeetus leucocephalus)* Osprey *(Pandion haliatus)*

Source: SC Department of Natural Resources, 2004.

4.16 Park Areas and Open Spaces

Recreation is beneficial to the health of Greenwood County citizens. Currently, the park sites in Greenwood County range from inner city parks with playgrounds to regional parks with an emphasis on ballfields. Provisions for various recreational opportunities for the public are necessary. Greenwood County's Department of Parks and Recreation monitors organized programs for citizens of all ages. Properties and staff used for these organized programs are maintained by county funding. However, before programs are devised there is a need to designate areas that are beneficial for future parks and open spaces.

Lake Greenwood serves as a major recreation site with natural beauty. Swimming, boating, picnicking and the like are benefits during the warmer seasons of the year. The Lake Greenwood State Park,

opened in 1940, is one natural highlight as it serves a multi-county area with lake access. Also available are 125 campsites, four picnic shelters, a nature trail, playground equipment, and fishing. In fiscal year 1994/1995, this park had 146,628 visitors. The Saluda River, north of Lake Greenwood, is a scenic area that provides canoeing and rafting.

The Sumter National Forest provides recreation opportunities with hiking trails, camping, fishing, and viewing and hunting of wildlife. This is the largest natural recreation area in Greenwood County. Greenwood County is fortunate to have these both the lake and national forest in the northern and southern portions of the County. Another point of interest is the Star Fort National Historic Site. This Revolutionary War fort serves as a site of natural and historical significance as well as a recreational facility for walking and jogging in a natural environment.

The Parks Commission, created in 1996 by the Greenwood County Council, is charged with the task of determining areas to be developed for passive recreational activities throughout the county. Passive recreational activities include hiking, biking, relaxing, picnicking or any other activity that is not intensive or organized; the antithesis would include soccer, baseball, etc. that can be incorporated into the park system. The Commission, a non-paid citizen-based group appointed by County Council, works with private donations and grants as its funding sources. A small stipend from County Council is designated for communication and mailing expenses. A legal entity, this group may acquire property on behalf of the county, apply for grants, and receive liability coverage for created parks and trails. Working in partnership with the Chamber of Commerce Parks Committee, a large volunteer group of citizens dedicated to bringing passive recreational sites and trails to Greenwood County, the Parks Commission has a long-term plan to meet the needs of all citizens.

The Parks Commission has identified abandoned rail corridors as potential linear parks. These railbeds, once transformed, offer walking, jogging, and bicycle opportunities and serve to connect neighborhoods and other regional passive recreational areas. Designated areas for trail development include the abandoned rail corridor southwest of Main Street running south to Greenwood Mills Mathews Plant, between Greenwood and Ninety Six along S.C. Highway 34, the rail line along U.S. Highway 25 between Greenwood and Hodges, a rail section within the Grendel Mill Village, and the Boy Scout Trail running parallel with Durst and Reynolds Avenues. An additional linkage includes a bike path proposed by the SCDOT along Calhoun Road that would provide a western connection between West Cambridge and loop around to Northside Drive. Future needs will necessitate outlying linkages or a “loop system” of greenways into a comprehensive linear park system around the City of Greenwood. The objectives of this rail-to-trail conversion include reduced vehicular traffic and increased passive recreation uses.

Community organizations must recognize their specified needs for passive recreational areas. The Parks Commission assists neighborhoods in the acquisition of sites and facilities as designated. For future residential neighborhoods, it is important to detail the community’s desire to include park areas within newly developed subdivisions for the use of the homeowners. Residential developers have always wanted to add qualities to their development that would enhance home or lot sales. In a recent *Wall Street Journal* article reported that a national survey by Market Perspectives, Inc. found that walking paths, bike paths, parks and nature preserves were rated as “extremely important” to home buyers over the traditional golf courses, tennis courts and swimming pools which are more costly for homeowners associations to maintain. Development incentives should be used to encourage developers to include community parks and open spaces for a win-win situation for themselves and potential home buyers. In a recent questionnaire conducted locally, 94.4% of those sampled felt that more land should be set aside for natural areas such as parks, open spaces, and forests.

4.17 Unique Scenic Views and Sites

One area of natural resource planning that is a benefit is preservation or enhancement of scenic views and sites. The views of mountains or sunsets are examples of this. In Greenwood County, there are a number of areas that are worth discussing as natural scenic sites. The main categories that were formed from these sites include rivers and water bodies, trees, agriculture, historic buildings and structures, and entranceways.

Primarily, Lake Greenwood and the Saluda River shoals near Ware Shoals are two water resources that have views that need protecting from development that would potentially nullify the scenic beauty of these sites.

Agricultural areas and tree-lined streets were another area of scenic importance. Grace Street in the City of Greenwood is scenic for its large trees that "grace" the street and provide a canopy over the traffic route. Trees, along with pastures, fields, and wooded areas are important to preserve from dense development. Three areas are identified for their natural beauty:

- property along Ross Road;
- property along Dixie Drive; and
- property along Highway 185.

Historic sites provide views that link nature with the built environment. Star Fort National Historic Site is a prime example. Located south of Ninety Six, Star Fort incorporates forested areas with an historic battlefield that would lose its charm and significance if it was located within an urban area. The downtown of Ninety Six and the communities of Bradley and Cokesbury are other examples of historic areas that are important. The Grendel Mill Village and Greenwood Mill Villages are sites that have natural charm as some of the state's earliest contemporary residential subdivisions. The South Main Depot in Greenwood was a scenic historic site for its significance for inner-city transportation and historical entranceway. The structure has recently been demolished which is another loss to the community's heritage.

When we think of the word "scenic" it immediately brings pictures or memories to mind. As such, entrances into Greenwood County and its communities are important. Many times, signs are the major form of notifying the traveler that they are entering a new community. Effective signage as well as a maintained and organized land use pattern can help. The goal is to give a traveler notice that they have arrived in Greenwood County or one of its communities.

4.18 Conservation Measures

There are many ways to ensure conservation of our natural resources. Recycling programs through the Greenwood County Recycling Office is an example of how a public initiative serves to protect our rivers, streams, and fields from refuse that takes years to decompose. By recycling, the public is able to extend the life of the current landfill therein reducing the costs to taxpayers and minimizing the need for continued landfill sites.

In addition to recycling programs, sustainable growth patterns are a conservation measure that needs to be researched and developed in Greenwood County. Waterway protection, along with flood plain protection, are important measures for the health, safety and welfare of the owners of property. These waterways should be conserved for the protection of the public. Also, tree protection or replacement along with agricultural protection and incentives are important to the natural beauty and economic benefit of the area. The governments of Greenwood City and County, in conjunction with local businesses, can set a precedent in South Carolina by moving toward LEED ("Leadership in Energy and Environmental Design") certification. LEED is a program that uses only certified environmentally sound building materials that not only help conserve the environment, but also promotes efficient energy use in the day to day operation of a building. A movement toward LEED certification by both local government and private business, along with these other conservation measures will promote conservation of our natural resources for generations.

4.19 Public Education

Public education is essential to the achievement of long-range goals and objectives. Involving individuals and educating them in best management practices at informative meetings is necessary. Some of the groups that should be targeted in this initiative include, but are not limited to, development groups and builders associations, school groups, homeowners associations, realtors, and the general public. Education is a way to show how local actions can either harm or help their environment.

4.20 Urban Sprawl

One area of natural resource planning that encompasses many areas previously mentioned in this element is urban sprawl. Urban sprawl is a term used for development that is continuous and exceeds the manageable level of infrastructure needs. An example of this would be a commercial development that moves from an inner-city location to a more rural site. Taxpayers save money when growth is encouraged where infrastructure currently exists. Suburbs that spread into the countryside require building new roads, sewer lines and schools. This type of development is not cost-effective as taxes and utility rates must be increased to meet the demand of development.

The antithesis of urban sprawl is sustainable growth. This concept is a widely held view of embracing a balance of economic, environmental and social needs as a community develops. Specifically, sustainable growth establishes incentives for development to occur within areas that are currently able to accommodate the proposed land use

4.21 Conclusion

In defining our natural resources, we cannot conclude without recognizing the public as Greenwood County's single greatest asset. It is the public who is the responsible party for voicing opinions and concerns on issues that comprise our daily lives. This element serves to inform the public on the natural resources of Greenwood County and provide the tools necessary for implementation of these objectives so that future generations may experience the natural beauty of our community.

Goals, Objectives, and Strategies for Implementation

Goals/Objectives/Strategies	Accountable Agency	Time Frame for Completion
Goal 4.1. – Promote a Clean Air Program in Greenwood County		
Objective 4.1.1. Provide natural defenses against air pollution		
Strategy 4.1.1.1. Encourage tree planting within urban areas	Local Governments and SC Forestry Commission	On-going
Strategy 4.1.1.2. Discourage open residential burning	Local Governments	On-going
Strategy 4.1.1.3. Minimize industrial emissions	SC DHEC	On-going
Objective 4.1.2. Provide legislative defenses against air pollution		
Strategy 4.1.2.1. Continue to monitor air quality throughout Greenwood County	SC DHEC	On-going
Strategy 4.1.2.2. Provide a community-wide Smoke Management Plan in cooperation with the SC Forestry Commission	Local Governments and SC Forestry Commission	2013
Strategy 4.1.2.3. Cooperate with neighboring counties along the Interstate 85 Corridor for air quality standards and practices	Greenwood County	On-going
Strategy 4.1.2.4. Continue to work with the SC Early Action Compact through the SC Department Health and Environmental Control	Greenwood County	On-going
Goal 4.2. – Protect Soil and Water Resources		
Objective 4.2.1. Maintain the integrity of our soil		
Strategy 4.2.1.1. Recommend natural buffers and best management practices along drainage ways to minimize soil erosion and intercept soil movement	Local Governments, Natural Resource Conservation Service, SC Forestry Commission	2011
Strategy 4.2.1.2. Support DHEC's monitoring of sites for percolation of on-site waste systems	Greenwood County	On-going
Strategy 4.2.1.3. Provide continued assistance to the public on soil types on specific land areas	Natural Resource Conservation Service	On-going
Objective 4.2.2. Maintain water quality and quantity		
Strategy 4.2.2.1. Continue to monitor existing and proposed developments for maintenance of watersheds	Greenwood City/County Planning Department	On-going
Strategy 4.2.2.2. Recommend the reduction of the 2-acre minimum requirement for local storm water regulations to not more than a 1-acre minimum	Greenwood City/County Engineering	2011
Strategy 4.2.2.3. Continue cooperation with DHEC on storm water review and retention for proposed developments	Greenwood City/County Engineering	On-going
Strategy 4.2.2.4. Provide a nonpoint source education program	DHEC	2012
Strategy 4.2.2.5. Support Clemson University and Natural Resource Conservation Service programs to educate landowners and provide conservation measures of agricultural production	Greenwood City/County Planning Department	On-going
Strategy 4.2.2.6. Recommend SC Forestry Commission best management practices to minimize nonpoint source pollution	Greenwood City/County Planning Department	On-going
Strategy 4.2.2.7. Research the need for buffer strips of natural vegetation along water bodies and tributary watercourses	Greenwood City/County Planning Department	2011
Strategy 4.2.2.8. Locate heavy industry where waste discharges present the least ecological threat	Planning Commission	On-going

Goals, Objectives, and Strategies for Implementation

Goals/Objectives/Strategies	Accountable Agency	Time Frame for Completion
Goal 4.2. – Protect Soil and Water Resources		
Objective 4.2.2. Maintain water quality and quantity		
Strategy 4.2.2.9. Maintain the quality, volume, and rate of flow of watershed drainage systems	DHEC, Natural Resource Conservation Service	On-going
Strategy 4.2.2.10. Review all residential development and construction applications for compliance with ecosystem protection requirements	Greenwood City/County Planning Department	2015
Strategy 4.2.2.11. Establish control measures in residential developments to prevent degradation of the quality, volume, and rate of flow of the natural drainage system of the watershed	Greenwood City/County Engineering Office	On-going
Strategy 4.2.2.12. Increase impervious surface ratios for developments in order to utilize permeable surfaces wherever feasible	Local Governments	2013
Strategy 4.2.2.13. Provide city/county best management practices and development incentives through a comprehensive development regulation for the development community	Greenwood City/County Planning Department	On-going
Objective 4.2.3. Protect flood plain and flood way areas		
Strategy 4.2.3.1. Conduct a more current Flood Insurance Study for Greenwood County	Local Governments, DHEC, Natural Resource Conservation Service, FEMA	2016
Strategy 4.2.3.2. Require storm water permitting for commercial and residential developments regardless of size	Local Governments	2011
Strategy 4.2.3.3. Encourage the use of traditional town development styles for incorporation as a viable construction alternative for developers	Local Governments	On-going
Strategy 4.2.3.4. Increase the impervious surface ratio requirements within critical watersheds of the County	Local Governments	On-going
Strategy 4.2.3.5. Encourage developers to utilize permeable surfaces wherever feasible	Local Governments	On-going
Strategy 4.2.3.6. Design storm drainage projects to simulate the natural pattern, as nearly as possible, and reduce the need for storm sewer systems	Local Governments	On-going
Strategy 4.2.3.7. Encourage diversion of storm water runoff and dispersion into areas of natural vegetation and soils, wherever feasible	Local Governments	On-going
Strategy 4.2.3.8. Delay storm water runoff with detention systems for dispersal and release at a flow simulating the predevelopment site	Local Governments	On-going
Strategy 4.2.3.9. Locate and isolate specific concentrated sources of runoff contamination for special treatment	Natural Resource Conservation Service, DHEC	On-going
Strategy 4.2.3.10. Revise the County Flood Ordinance to incorporate BMPs	Greenwood City/County Engineering	2011
Strategy 4.2.3.11. Maintain emergency preparedness services for the threat of flooding	Greenwood County	On-going
Strategy 4.2.3.12. Provide water review systems in order to be good stewards of water sources to downstream communities that also rely on our water resources	Natural Resource Conservation Service, DHEC	On-going
Strategy 4.2.3.13. Coordinate with upstream counties and local governments for an interregional approach for water conservation and protection	Local Governments	On-going

Goals, Objectives, and Strategies for Implementation

Goals/Objectives/Strategies	Accountable Agency	Time Frame for Completion
Goal 4.2. – Protect Soil and Water Resources		
Objective 4.2.4. Plan for geologic hazards		
Strategy 4.2.4.1. Control the location and operation of extractive industries to avoid damage to the environment, primarily drainage ways and other water bodies	Planning Commission	On-going
Strategy 4.2.4.2. Notify the public, at time of building permitting, if the proposed site for development is within a fault zone area	Greenwood City/County Building Inspection	2011
Strategy 4.2.4.3. Encourage schools, businesses and residents to practice earthquake drills	Greenwood County Emergency Preparedness	On-going
Strategy 4.2.4.4. Update emergency preparedness plans to incorporate fault zones and conduct earthquake drills with emergency personnel	Greenwood County Emergency Preparedness	On-going
Goal 4.3. – Expand and Sustain the Natural Environment		
Objective 4.3.1. Protect prime agricultural lands		
Strategy 4.3.1.1. Encourage agricultural land uses in fertile areas of Greenwood County	Planning Commission	2012
Strategy 4.3.1.2. Develop zoning districts that encourage and protect agricultural production in fertile areas of Greenwood County in cooperation with Clemson University, the Natural Resource Conservation Service and the SC Forestry Commission	Planning Commission	2012
Strategy 4.3.1.3. Reduce agricultural complaints by buffering agricultural uses from industrial and residential land uses	Planning Commission	2012
Objective 4.3.2. Protect prime forest lands		
Strategy 4.3.2.1. Encourage the public to utilize BMPs of the SC Forestry Commission for forest management	Greenwood City/County Planning Department	2013
Strategy 4.3.2.2. Develop ways to increase the usage of trees in developments to reduce heating costs and increase property values	Greenwood City/County Planning Department	On-going
Objective 4.3.3. Expand the urban forest		
Strategy 4.3.3.1. Enact community-based local incentives for developments to protect or replant the urban forest	Local Governments	2012
Strategy 4.3.3.2. Evaluate the need for local governments and utility companies to establish tree management programs through local funding sources	Local Governments and Local Utilities	On-going
Strategy 4.3.3.3. Evaluate the need for a tree board or commission for support and guidance of local forestry programs	Local Governments	2011
Strategy 4.3.3.4. Qualify the City of Greenwood for a Tree City USA award	City of Greenwood	2011
Strategy 4.3.3.5. Evaluate the Tree City USA program for other Greenwood County communities	Greenwood City/County Planning Department	2012
Strategy 4.3.3.6. Revise and improve land requirements for commercial and industrial development to increase the natural tree cover	Greenwood City/County Planning Department	2013

Goals, Objectives, and Strategies for Implementation

Goals/Objectives/Strategies	Accountable Agency	Time Frame for Completion
Goal 4.3. – Expand and Sustain the Natural Environment		
Objective 4.3.4. Protect plant and animal habitat		
Strategy 4.3.4.1. Develop a species management plan for reproduction of rare, threatened, or endangered species in coordination with the SC Forestry Commission and SC Department of Natural Resources	Greenwood City/County Planning Department, SC Forestry Commission, SC Department of Natural Resources	2013
Strategy 4.3.4.2. Establish a wildlife management plan for endangered or threatened species in Greenwood County	Greenwood City/County Planning Department	2013
Strategy 4.3.4.3. Provide programs to encourage wildlife habitat on private property	Department of Natural Resources	2013
Goal 4.4. – Promote Growth Management Principles		
Objective 4.4.1. Promote parks and open spaces		
Strategy 4.4.1.1. Encourage agricultural land uses in fertile areas of Greenwood County	Greenwood County, Natural Resource Conservation Service	On-going
Strategy 4.4.1.2. Develop zoning districts that encourage and protect agricultural production in fertile areas of Greenwood County in cooperation with Clemson University, the Natural Resource Conservation Service and the SC Forestry Commission	Greenwood City/County Planning Commission	On-going
Strategy 4.4.1.3. Reduce agricultural complaints by buffering agricultural uses from industrial and residential land uses	Greenwood City/County Planning Commission	2012
Strategy 4.4.1.4. Encourage the donation of land to the Upper Savannah Land Trust through conservation easements	Upper Savannah Land Trust	On-going
Strategy 4.4.1.5. Encourage developers, through incentives, to include recreational areas in residential developments	Greenwood City/County Planning Commission	2012
Strategy 4.4.1.6. Provide protection to scenic areas in Greenwood through overlay zones or other suitable measures	Greenwood City/County Planning Commission	2014
Strategy 4.4.1.7. Provide entranceway enhancement projects along major highway corridors in the County	Greenwood County	2015
Strategy 4.4.1.8. Provide entranceway enhancement projects along major highway corridors leading into municipalities	Local Governments	2015
Objective 4.4.2. Educate the public on the effects of urban sprawl and effective conservation measures		
Strategy 4.4.2.1. Encourage developments to utilize or redevelop vacant sites for sustainable growth	Local Governments	On-going
Strategy 4.4.2.2. Encourage tree replacement when development occurs to enhance the scenic beauty of a site, control micro-climates or heat islands, and increase pervious surfaces	Local Governments	2012
Strategy 4.4.2.3. Protect agricultural areas from incompatible land uses and develop incentives for agricultural production	Planning Commission, Clemson Extension and Natural Resource Conservation Service	On-going

Goals, Objectives, and Strategies for Implementation

Goals/Objectives/Strategies	Accountable Agency	Time Frame for Completion
Goal 4.4. – Promote Growth Management Principles		
Objective 4.4.2. Educate the public on the effects of urban sprawl and effective conservation measures		
Strategy 4.4.2.4. Promote the use of LEED certified products in all new government buildings, as well as recognize the efforts of local businesses that use LEED certified building materials	Local Governments	On-going
Strategy 4.4.2.5. Develop a web page to identify BMPs for development and construction	Natural Resource Agencies	2013
Strategy 4.4.2.6. Develop natural resource pamphlets that incorporate important information to be distributed to the public	Natural Resource Agencies	2013
Strategy 4.4.2.7. Produce a presentation in cooperation with natural resource agencies to describe the importance of BMPs to local groups	Natural Resource Agencies	2013
Strategy 4.4.2.8. Promote an educational program for developers, builders, utility companies, and citizens on the need to protect and preserve trees	Natural Resource Agencies	2013
Strategy 4.4.2.9. Promote the utilization or redevelopment of existing buildings that are currently vacant	Local Governments	On-going
Strategy 4.4.2.10. Develop sustainable growth patterns within a comprehensive land use plan	Planning Commission	On-going